CHAPTER 9: EQUIPMENT REQUIREMENTS AND MAINTENANCE.

I. **Introduction.** The proper use and maintenance of equipment utilized in helicopter operations by both ground, flight crew, and air crew personnel is essential to safety. Since much of this equipment is of relatively high cost, proper maintenance is also cost-effective.

II. **Interagency Fire Helicopter Equipment Requirements.** The required items for interagency-carded fire helicopters change frequently. For CWN fire helicopters, use and completion of Form HCM-2, Helicopter and Service Truck Pre-Use Checklist, with reference to the procurement document, should ensure that requirements are met. See Appendix A for instructions on completing this form. Consult the exact terms of the procurement document if uncertain about requirements.

III. ☞ **Personal Protective Equipment (PPE).** Personal protective equipment (PPE) consists of clothing and equipment that provide protection to an individual in a hazardous environment.

If any flight crew member, air crew member, or passenger refuses to adhere to PPE requirements, the Helicopter Manager shall terminate the flight and report the non-compliance to the unit aviation manager utilizing an agency incident/hazard report. Similarly, if an individual participating in a ground helicopter operation refuses to wear required PPE, the operation shall be halted and a report filed.

Charts 9-1 provide a summary of personal protective equipment requirements for various aerial missions.

☞ Chart 9-2 establishes PPE requirements for ground operations when helicopters are operating. It is at the discretion of the Helibase Manager, Deck Coordinator or Helicopter Manager to establish the appropriate level of PPE on the ground when no active helicopter operations are being conducted. Consult the specific helicopter procurement document for vendor personnel PPE requirements.

Chart 9-1: Requirements For Personal Protective Equipment - Flight Missions

CHART 9-1: Personal Protective Equipment Requirements For Flight Missions

FLIGHT MISSION:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
POINT-TO-POINT (One developed airport/heliport to another developed airport/heliport)	X[1]			X		X		X							X			
RECONNAISSANCE (LAND) (HIGH OR LOW-LEVEL)	X[1]			X		X		X							X			
RECONNAISSANCE OVER WATER - BEYOND GLIDING DISTANCE FROM SHORE	X[1]			X		X		X				X	X[1]		X			X[2]
RECONNAISSANCE OVER WATER - EXTENDED	X[1]			X		X		X				X	X[1]		X			
FIREFIGHTER[3]		X			X	X		X							X			
HELICOPTER CREW (Fire or Project, to include Pilots, Flight and Air Crew members etc.)	X[1]			X		X		X							X			
OPERATIONS WHERE INDIVIDUAL NOT RESTRAINED BY SEAT BELT (Spotter, Cargo Letdown, Cargo Freefall, ACETA, Video, FLIR	X[1]			X		X		X							X		X	
SNOW/WET BOGGY AREAS	X[1]			X		X		X[2]	X[2]						X			
RAPPEL, SHORT-HAUL, AND CARGO LETDOWN	Requirements are contained in the applicable guide.																	
OFFICIAL PASSENGER (NON-GOVERNMENT)	Requirements same as for government employees																	

KEY

1 = Nomex Flight Suit
2 = Nomex Shirt/Pants
3 = Non-Static Clothing
4 = Aviator Flight Helmet
5 = Hardhat with chinstrap
6 = Nomex or Leather Gloves
7 = Rubber Gloves
8 = Leather Boots
9 = Rubber/Synthetic Boots
10 = High-Visibility Vest
11 = Life Vest
12 = Personal Flotation Device
13 = Raft & Kit
14 = Eye Protection
15 = Hearing Protection
16 = Respirator/Dust mask
17 = Approved Restraint Harness
18 = Anti-exposure Garments

[1] Nomex shirt and pants may be substituted for nomex flight suit.

[2] Refer to Agency policy.

[3] Due to frequent exposure and the extra protection afforded, the nomex flight suit, aviator flight helmet, and nomex gloves will be worn by exclusive-use helicopter crews (fire or project). The only acceptable situation where a hardhat maybe substituted for a flight helmet is as follows: Passenger Transportation during fire suppression operations between an established, managed helispot/helibase and an established, managed helispot/helibase.

Chart 9-2: Requirements For Personal Protective Equipment - Ground Operations

CHART 9-2: Personal Protective Equipment Requirements For Ground Helicopter Operations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
GROUND MISSIONS																		
HELIBASE MANAGER, TOLC, RADIO OPERATOR, AIRCRAFT TIMEKEEPER[1]		X			X	X		X						X	X			
DECK COORDINATOR		X			X	X		X						X	X			
PARKING TENDER		X			X	X		X		X				X	X			
LOADMASTER		X			X	X		X						X	X			
HOVER HOOKUP OR OTHER PERSONNEL WORKING BENEATH OPERATING HELICOPTERS		X			X	X		X						X	X			
LONGLINE		X			X[2]	X		X						X	X			
HELITORCH MIXMASTER/CREW			X		X	X	X[3]	X						X	X	X		
FUELERS[4]			X		X	X		X						X	X			

KEY

1 = Nomex Flight Suit
2 = Nomex Shirt/Pants
3 = Non-Static Clothing
4 = Aviator Flight Helmet
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14 = Eye Protection
15 = Hearing Protection
16 = Respirator/Dust mask
17 = Approved Restraint Harness
18 = Anti-exposure Garments

[1] Hardhat, gloves, and eye protection not required when personnel are in the operations and communications area (that is, not on the Deck).

[2] If available, aviator flight helmet with adapter to handheld radio recommended (radio is required regardless of whether hardhat or flight helmet is used).

[3] May substitute rubber gloves.

[4] Ear and eye protection required only when in the vicinity of operating helicopters (for example, hot refueling). Rubber gloves may substitute for leather gloves. Contractor fueler must adhere to NFPA standards for required protective clothing.

A. **Protective Head Gear.** When flying or when working on the ground around operating helicopters, only approved headgear shall be worn, according to the situations and associated requirements outlined in Charts 9-1 and 9-2. The Pilot must always wear the flight helmet.

☞ 1. **Aviator Flight Helmets.** The aviator flight helmet, consisting of a one-piece hard shell made of polycarbonate, Kevlar, carbon fiber or fiberglass must cover the top, sides (including the temple area and to below the ears) and the rear of the head. The helmet shall be equipped with a chinstrap and shall be appropriately adjusted for proper fit; helmets should be individually fitted for maximum protection.

☞ Flight helmets for helicopter usage must conform to a national certifying agency standard such as DOT, Snell, SFI or an appropriate military standard, or appropriate equivalent standard. Examples of flight helmets currently approved include the SPH-3, SPH-4, SPH-5, HGU-56 & HGU-84. "Shorty" helmets are not approved. Helmets designed for use in fixed wing aircraft do not provide adequate protection for helicopter occupants and are not approved for helicopter use.

The flight helmet should be equipped with avionics compatible with helicopter avionics specifications. Each helmet should be stored in a helmet bag when not in use, and should be kept clean and free of defects. Clean with mild soap and water only.

2. **Hard Hats.** The hard hat must be equipped and worn with a chin strap securely fastened below the chin prior to entry to the helicopter, at all times during flight, and upon departure from the aircraft.

B. **Hearing Protection.** Hearing protection is required in all locations having a noise exposure equal to or exceeding an 8-hour time-weighted average sound level of 85 decibels. This will include the inside of most helicopters and on nearly all heliports, helibases, and helispots during the conduct of operations. The aviator's flight helmet provides the requisite protection; the addition of earplugs for frequent users of helicopters is recommended.

For persons not requiring communications during flights, earplugs may be substituted.

Sound barrier "earmuffs" may be worn in lieu of ear plugs while performing ground operations.

C. **Eye Protection.** Eye protection is required for ground personnel where dusty conditions exist. This will include most off-airport helicopter landing sites.

Goggles shall be worn while performing ground duties around operating helicopters. An aviators helmet with visor down may be utilized in lieu of a hard hat and goggles when radio communications with the pilot is necessary via a radio connected through the helmet.

D. Fire-Resistant Clothing. The primary purpose of fire-resistant clothing is to provide the wearer with protection from flash fire burns.

1. Material. The approved material for flight suits, gloves, and recommended for outergarments, garments worn under the flight suit, and undergarments is generically known as "Nomex." The actual material may be Nomex, polyamide, aramide, polybenzimidazole, Kevlar, or blends thereof. Reference to Nomex elsewhere in this guide refers to all of the above materials.

NOTE: Nomex material may be laundered and tumble dried at temperatures up to 180ß F. without shrinkage or damage. Dry cleaning is also approved. Starch is <u>not</u> approved, since fire-resistance is lost when starch is applied.

WARNING: All garments <u>must</u> be clean. Aviation fuels, grease, oils, and other combustible materials embedded in the fabric will burn at their normal flash points even though the Nomex will not char until a higher temperature is reached.

2. Flight Suits. Flight suits are Nomex coveralls that fit loosely and provide trapped airspace that acts as insulation to provide protection in a fire. The proper size flight suit covers the maximum area of skin. This includes sleeves long enough to reach the first knuckle on the thumb before securing snugly over the flight gloves at the wrist. The pant legs shall be long enough to completely cover the boot tops while in a seated position. The slide fastener front closure provides coverage high on the neck. Flight suits are available in 4.5-ounce and 6.0-ounce material.

3. Shirt/Trousers Combination. The use of the wildland firefighter Nomex shirt and trousers (two-piece) are authorized. The shirt sleeves and trouser legs shall have sufficient length to allow overlap of the glove cuffs and boot tops, respectively. Shirt cuffs shall be worn down and fastened. When wearing two-piece flight suits or the shirt/trouser combination, the shirt shall be tucked into the trousers.

4. Hand Protection. Flight gloves are constructed of a soft leather palm and stretchable Nomex fabric for the back. The glove has a long cuff extending several inches above the wrist to provide total coverage when the Nomex flight suit or shirt sleeve is properly worn. The gloves should fit snugly to provide maximum finger dexterity for the wearer. All-leather gloves, without synthetic liners, are also approved if

they provide wrist coverage and allow the finger dexterity required for the tasks assigned the wearer. Gloves should be free of holes, tears, oils, fuel, and grease.

5. **Outerwear Garments.** Coats, bib pants, coveralls, etc. made of Nomex and worn over the flight suit (but not as a substitute for the flight suit) are recommended, but are not required, during cold-weather flight activities. Outerwear garments made from fire-resistant cotton blends, fire-resistant cotton, or natural fibers (cotton, wool, or wool/cotton blends) are acceptable substitutes.

CAUTION: Natural fiber/synthetic blends or pure synthetics require discretionary agency-specific authorization.

6. **Undergarments or Garments Worn under the Flight Suit.** Underwear (normal temperature or cold weather insulating) and other clothing (for example, work uniforms) worn under the flight suit or shirt/trousers combination will provide the best protection if made of Nomex. However, Nomex is not required. Fire-resistant cotton blends, fire-resistant cotton, or natural fibers (cotton, wool, or wool/cotton blends) are acceptable substitutes.

CAUTION: Undergarments or garments worn under the flight suit or shirt/trousers combination which have direct contact with the wearer's skin present an unacceptable exposure to post-mishap fire injury if made of materials containing low-melt synthetics. Exceptions for synthetics or natural fiber/synthetic blends are not approved.

Some agencies require or allow the work uniform to be worn under the flight suit. This is approved provided the uniforms are fabricated of Nomex or an alternative fire-resistant or natural fiber material as defined above.

E. **Protective Footgear.** Boots must be made of all-leather uppers that come above the ankles (the higher, the better). Rubber, nylon (or other synthetics), or boots made partially of these materials will either melt or burn in a fire, causing severe burns to the feet. They are prohibited except as specified below.
If the required leather boots are not conducive to the working environment (water, snow, etc.), an alternative may be available. The agency may determine that rubber boots or synthetic "snow boots" are essential to perform some projects or for work in extreme cold. If these alternatives to leather boots are utilized, the government supervisor shall inform the employee(s) of the increased personal hazard associated with these type boots in the event of a post-mishap flash fire. Such exceptions must be made in writing.

RECOMMENDATION: Nomex socks, heavy natural fiber socks, or wool felt inserts should be worn when utilizing alternative footwear.

F. **Exceptions to PPE Requirements.** Exceptions to the PPE requirements for Pilots, air crew members, and passengers include, but are not limited to the following:

- Overwater Flights. The requirement for fire-resistant clothing and boots is waived for overwater flights made beyond gliding distance of shore. Locally-approved footgear and clothing (anti-exposure suits or personal flotation devices) must be worn. Nomex anti-exposure suits are available for those who wish the dual fire and exposure protection. This exception does not delete the prohibition from wearing garments, undergarments, or outerwear made of pure synthetic materials.

- Law Enforcement. For non-tactical missions, standard PPE requirements apply. For tactical operations, the Incident Commander or designee should evaluate the mission with consideration for the degree of risk associated with flying and the anticipated risk of the law enforcement operation. Approved PPE will be prescribed for the specific law enforcement mission by the Incident Commander.

- Application of Chemicals. Fire-resistant clothing is not required for ground personnel involved in aerial application of chemicals. However, clothing and other protective devices such as respirators must adhere to OSHA regulations.

- Snow, Winter, or Water Conditions. If the required leather boots are not conducive to the working environment (water, snow), then other foot apparel such as rubber or synthetic boots may be substituted. This exemption is agency- and area-specific.

☞ Agencies also have the authority to grant waivers to standard PPE requirements. The level of authority at which the waiver is made is agency-specific. Exceptions from requirements usually are limited to situations where protection of the individual after exiting the aircraft is deemed more critical toward personal safety and security than that provided by the aviation PPE.

NOTE: When the full complement of PPE is not worn, the government supervisor is required to inform the crew and passengers of the increased personal hazard associated with wearing non-fire-resistant clothing.

An example would be an activity such as search and rescue where specialized PPE or clothing necessary for protection against arctic temperatures for extended periods of exposure are deemed critical to individual survival. Management should make every effort to provide fire-resistant clothing in the excepted clothing.

IV. **Survival Equipment.** This section covers requirements for survival equipment for overwater missions, survival kits for special use overland missions, and first aid kits for all missions. It is the responsibility of the Helicopter Manager or Project Flight Manager for each flight to ensure that proper and adequate survival equipment for the planned mission is aboard and available for all crew members and passengers.

NOTE: All survival equipment required by this section requires scheduled inspections, testing, and, in some instances, a timed replacement procedure. Management at the using level shall establish and monitor the appropriate compliance procedure.

A. **Overwater Flotation and Survival Equipment.** The approved flotation gear required by 14 CFR 91 "for hire" flight activities shall be on board from beyond power-off gliding distance to shore out to extended overwater operations. The emergency equipment for extended overwater operations required by 14 CFR 135 shall be on board for extended overwater activity.

NOTE: Mission planning for over water flight requires careful consideration of all elements of the risk management and hazard reduction process outlined in Chapter 3. Aviation Life Support Equipment (ALSE) appropriate for the overwater mission being planned must be based on flight time over water, flight following (report frequency and accuracy), water/air temperature, search and rescue availability and response time to the mission area, and the capability of the proposed ALSE to sustain life.

1. **Personal Flotation Devices (PFD).** Personal flotation devices compatible for wear and use in helicopters are required for all operations beyond gliding distance from shore. Effective January 1, 1995, the PFD shall meet the standards of Technical Standard Order (TSO) C13 and be a twin-cell, self-righting, life preserver providing a minimum of 35-pound buoyancy, with two CO_2 charging cartridges and provision for back-up inflation by mouth. The PFD may be of a standard life preserver configuration or incorporated into a survival vest with the TSO-C13 buoyancy and other characteristics.

   PFD's shall be worn at all times by all occupants of helicopters which do not meet the overwater performance capability required by 14 CFR 135. The PFD's need not be worn but shall be immediately available to each seated occupant of multi-engine helicopters that meet the overwater performance capability required by 14 CFR 135.

Agencies may allow alternatives to the TSO-C13 life preserver. Consult agency guidance or directives for allowed alternatives.

CAUTION: Users of PFD's must be trained in their proper use.

2. Anti-Exposure Garments. The anti-exposure flight suit shall be a one-piece coverall insulated to provide some hypothermia protection, and providing some buoyancy. A hood and hand protection shall be carried in a specific pocket provided for that purpose. All new or replacement suits that are purchased after the initial publication of this guide should be manufactured of fire-resistant material.

The "shorty" wet suit shall be closed-cell foam insulated, long sleeved garments covering the entire trunk, arms, and upper thighs. It must be worn over underwear and under the anti-exposure flight suit or regular flight suit. It should include a pair of 3-finger wet suit mitts and a hood. The "shorty" wet suit may be worn under a standard flight suit in lieu of an anti-exposure flight suit only when the air and water temperatures are above 50$^{\beta}$ F.

Survival (dry) suits shall be closed-cell insulated dry immersion suits designed primarily for post-egress. The suits shall be worn over fire-resistant garments.

CAUTION: The flotation provided by the dry suits may cause a hazard during egress from a submerged helicopter. Egress training is highly recommended.

3. Life Rafts. Life rafts are required for extended overwater missions in accordance with 14 CFR 135. The life rafts shall meet the requirements of TSO-C70a/C12c and shall be installed in conspicuously marked locations accessible to all occupants. Enough life rafts of a rated capacity and buoyancy shall be available to accommodate all occupants.

B. Overland Survival. Like overwater missions, planning for overland missions requires careful consideration of all elements of risk management and hazard reduction. On overland flights, personnel will be more likely to possess appropriate garments for the mission area involved. This does not exempt mission planners from assuring that crews and passengers have adequate clothing to survive in the event of a mishap.

1. Survival Kit. Refer to Chart 9-3. Survival kits are required for all special use activities and are highly recommended for all natural resource support missions. Survival kits shall contain at a minimum the items specified in the chart, plus those items required by seasonal, other environmental conditions, or by the FAR's (for example, life rafts for extended overwater missions).

Refer to Chart 9-4 for emergency equipment requirements for flights in Alaska. Alaska law requires that no pilot may make a flight inside the state with an aircraft unless emergency equipment is carried as specified in the chart.

Refer to Chart 9-5. Additional items may be required by agency-specific Aviation Life Support Equipment (ALSE) requirements. This list is recommended, depending upon the season, in areas of the country where either extreme heat or extreme cold is encountered. Agency ALSE requirements may duplicate some of these recommendations, or agencies may be more restrictive (that is, more equipment or supplies may be required).

CHART 9-3: STANDARD AERONAUTICAL SURVIVAL KIT - SPECIAL USE MISSIONS

NO. REQUIRED	ITEM
1 Each	Knife, Folding Blade
1 Each	Signal Mirror
6 Each	Signal Flares
20 Each	Matches, Waterproof
1 Quart/Occupant (Not required when operating over areas where adequate water suitable for drinking is available)	Water
1 Each/Occupant	"Space" Blanket or other Protective Covering
2 Days/Occupant	Food (emergency rations)

CHART 9-4: ALASKA REQUIRED EMERGENCY EQUIPMENT

NO. NEEDED	WINTER (October 15-April 1)	SUMMER
2 Weeks Supply	Food for each occupant sufficient to sustain life	Same
1	Axe or hatchet	Same
1	First aid kit	Same
1	Pistol, revolver, shotgun, or rifle and ammunition for same	Same
1	Small gill net and an assortment of tackle such as hooks, flies, lines, sinkers, etc. Knife	Same
1	Small boxes matches	Same
2	Mosquito headnet for each occupant	Same
1	Small signaling devices such as colored smoke bombs,	Same
2	railroad fusees, or Very pistol shells, in sealed metal container(s)	Same
1 Pair	Snowshoes	NA
1	Sleeping bag	NA
1	Wool blanket for each occupant over 4 years age	NA

CHART 9-5: RECOMMENDED SURVIVAL KIT - EXTREME ENVIRONMENTAL CONDITIONS

#	WINTER	#	SUMMER
1	Compass	1	Compass
1	Knife	1	Knife
1	Flashlight with 2 extra batteries	1	Flashlight with 2 extra batteries
1	Signal Mirror	1	Signal Mirror
1	Additional Signalling Device (Strobe, Smoke Bomb, Water Dye, etc.)	1	Additional Signalling Device (Strobe, Smoke Bomb, Water Dye, etc.)
1	Box Matches in Waterproof Container	1	Box Matches in Waterproof Container
1	Individual First Aid Kit	1	Individual First Aid Kit
1	40' Length Nylon Rope	1	40' Length Nylon Rope
1	Roll Toilet Paper	1	Roll Toilet Paper
2	Candles	2	Candles
1	50 Gal. Capacity Trash Bag	1	50 Gal. Capacity Trash Bag
4	Quarts Water/Person	4	Quarts Water/Person
1	Water Bag	1	Water Bag
1	Whistle	1	Whistle
1	Handsaw or Wiresaw	1	Handsaw or Wiresaw
1	Collapsible Shovel	1	Collapsible Shovel
6	Meals-Ready-To-Eat (MREs)/Person	4	Meals-Ready-To-Eat (MREs)/Person
1	Survival Manual, Winter	1	Survival Manual, Desert
1	46 pt. IV Tubing	1	46 pt. IV Tubing
1	Bottle Iodine Tablets	1	Bottle Iodine Tablets
1	Arctic Sleeping Bag/2 persons	1	Snakebite Kit
1	Metal Container (for melting snow)	1	Bottle Insect Repellent

2. **Personal Survival Vests or Hand-Carried Survival Kits.** In addition to the required survival kits, personal survival vests or hand-carried survival kits are strongly recommended but not required.

CAUTION: Accident experience has shown conclusively that survival equipment not attached to the occupants at the time of egress will not be available to the survivors.

3. **First-Aid Kit - Aeronautical.** Refer to Chart 9-6. Each first-aid kit must be contained in a dust-proof, moisture-proof metal or heavy plastic container that is readily accessible to the pilot and passengers. Kits that are FAA-approved for the number of crew and passengers carried are commercially available. The contents include the minimum items specified on the chart.

Chart 9-6: Standard Aeronautical First-Aid Kit

ITEM	NUMBER NEEDED: PASSENGER SEATS 0-9	NUMBER NEEDED: PASSENGER SEATS 10-50
Adhesive bandage compresses, 1"	8	16
Antiseptic swabs, 10MM	10	20
Ammonia inhalants, 6MM	5	10
Bandage compresses, 4"	4	8
Triangular bandage compresses, 4"	4	10
Burn compound (aerosol cans)	1	3
Roller bandage, 4"	2	4
Adhesive tape, 1"	2	2
Bandage scissors	1	1
Blood-borne pathogen Kit	1	1
NOTE: Arm and leg splints are recommended if space permits.		

V. Aircraft Equipment. Equipment shall be installed per agency specifications on agency-owned helicopters and per the procurement document on vendor helicopters.

A. Personnel Restraints, Seat Belts, and Harnesses.

1. General Requirements. The following are required for all helicopter flight activities, except for special activities as outlined in Section V.A.2, Restraints For Special Activities, below.

- FAA-approved double-strap shoulder harness with automatic-locking inertia reels for each front seat occupant.
- Lap belts for all aft seat passengers. If shoulder harnesses are installed in the aircraft, they shall be worn.

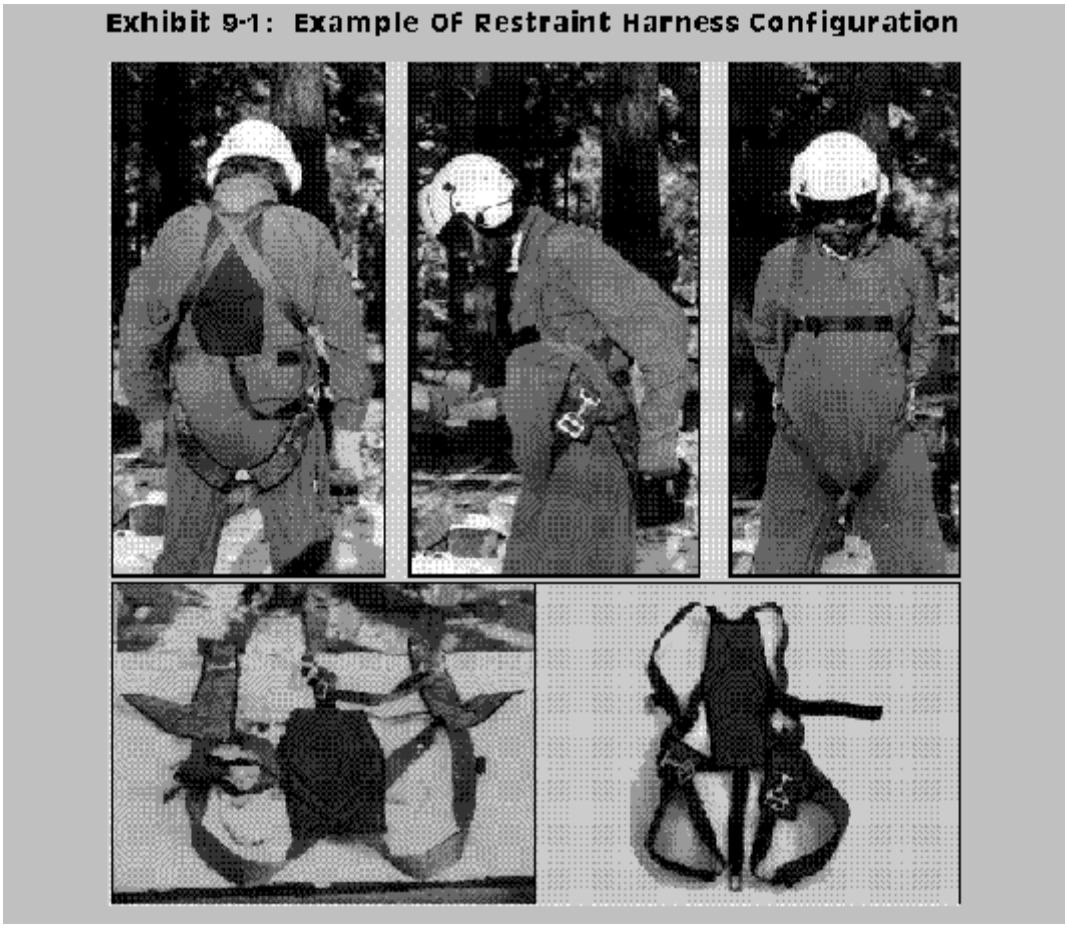
- Shoulder straps and lap belts shall fasten with one single-point, metal-to-metal, quick-release mechanism. Heavy-duty (military style) harnesses such as those installed in Bell medium helicopters are acceptable although they have fabric loops connecting the shoulder harnesses to the male portion of the insertable part of the buckle.

2. **Restraints For Special Activities.** Special activities which may require restraint systems other than the seat belt/shoulder harness configuration include, but are not limited to helicopter rappelling, aerial ignition using the plastic sphere dispenser, animal net gunning, shooting, or tagging, cargo letdown, photography, and infrared sensing.

   Personnel performing special activities and who need to be in a location other than normal (that is, seated with normal restraint system), must wear an approved harness. The harness must have a quick release system and should be attached to a helicopter hard point. See Exhibit 9-1.

   For additional information on restraints for special activities, refer to the appropriate guide (for example, Interagency Helicopter Rappel Guide) or agency directive.

EXHIBIT 9-1: EXAMPLE OF RESTRAINT HARNESS CONFIGURATION



B. **Emergency Locating Transmitter (ELT).** An Emergency Locator Transmitter (ELT) shall be installed on helicopters.

C. **Emergency Position Indicator Radio Beacon (EPIRB).** The EPIRB is an ELT that meets TSO C-91, designed specifically for in-water use. The EPIRB is battery-operated, water-resistant, and will float with the attached antenna vertical. An EPIRB should be included in the survival equipment carried in life rafts. Units required for extended overwater operations should be "Class A" with automatic water activation and a manual activation provision.

A "mini Class B" EPIRB is approved for use with life vests (survival vests, survival suits, and life rafts not required to meet the extended overwater operations criteria). These units may be manually or water-activated, and shall include a float collar or be secured to the vest.

D. **Personal Emergency Locator Transmitter (P-ELT).** The P-ELT is available from several manufacturers. Typical designations include "Portable Rescue Beacon," "Personal Downed-Pilot Locator," or "Human Emergency Locator." These units are not required but are highly recommended to be included in personal survival vests or float vests where a mini-EPIRB may be too large.

All the units are rescue satellite compatible, waterproof, and small in size. However, not all units are TSO-C61a-approved. Typically, the TSO'd units provide longer battery life (72 hours versus 30 hours) and dual frequencies (121.5 MhZ and 243.0 MhZ).

E. **Fire Extinguisher.** A fire extinguisher meeting the requirements of the procurement document shall be installed in the helicopter.

VI. **Crash-Rescue Equipment for Helicopter Landing Sites.** The following requirements apply to helicopter landing sites on incidents or projects. Consult Appendix K for ordering information. Chapter 12 contains additional crash-rescue information and discussion.

A. ☞ **Requirements For Fire Extinguishers, Evacuation Kits, and Crash-Rescue Kits At Helicopter Landing Sites.** Personnel must be trained and briefed in the use of crash-rescue equipment. Chart 9-7 specifies required numbers and types for helibases (for Helispot requirements, see Chart 8-2). There is no extinguisher requirement for an unimproved landing site unless the site is used on a recurring basis.

Chart 9-7: Extinguisher, Crash-Rescue, and Evacuation Kit Requirements

For Helibases

NO. OF HELICOPTERS	NUMBER AND TYPE EXTINGUISHERS	NO. OF CRASH-RESCUE KITS	NO. OF EVACUATION KITS
1-4	1 20-pound 40-B:C Extinguisher per landing pad	1	1
5-10	1 20-pound 40-B:C Extinguisher per landing pad	2	2
11 +	1 20-pound 40-B:C Extinguisher per landing pad	1 Kit per every 5 helicopters	1 Kit per every 5 helicopters

Permanent helibases should have the amount of equipment indicated for the largest operation that could be accommodated at the permanent helibase. In addition, it is recommended that permanent helibases substitute a wheeled, aircraft-type extinguisher for the 20-pound, 40-B:C extinguisher.

B. Crash-Rescue Kit. The crash-rescue kit consists of the items specified in Chart 9-8. See Chapter 12 for further information and discussion concerning use of the crash-rescue kit.

Chart 9-8: Crash-Rescue Kit Components

QUANTITY	ITEM
1 Ea	Axe, Crash, Serrated Edge
1 Ea	Axe, Crash, Smooth Edge
10 Ea	Blade, Hacksaw
1 Ea	Case, Cloth, Carrying, 2-piece Set
1 Ea	Cutter, Bolt, 24"
1 Ea	Frame, Hacksaw
1 Ea	Knife, Rescue, Seat-belt Type
1 Ea	Opener, Door, w/ Claw Tool

C. Evacuation Kit. The Evacuation Kit consists of the items specified in Chart 9-9. See Chapter 12, Fire Protection And Crash-Rescue, for further information and discussion concerning use of the evacuation kit.

CHART 9-9: EVACUATION KIT COMPONENTS

QUANTITY	ITEM
1 Ea	Bag, cotton, lunch or tool, 10" x 24"
8 Ea	Battery flashlight, size D, 1.5 Volt
3 Ea	Blanket, paper, disposable, 60" x 90"
4 Ea	Compress, cold
1 Hk (Hank)	Cord, cotton braided, 1/8" x 100'
1 Ea	Cover, vinyl, basket stretcher, 1/2 length
2 Ea	Head lamp electric, 4 cell
3 Ea	Ground marker
1 Kt	Kit, first aid, 24 person
1 Ea	Pamphlet, OPM-14, "How To Help The Injured"
1 Ea	Pliers, slip joint, 6"
2 Hk	Rope, nylon. 1/4" X 100'
1 Ea	Screwdriver, flat tip, 6"
1 Se	Splints, inflatable, all limbs, 6 piece
1 Ea	Stretcher, basket, 2 piece

VII. **Standard Equipment for External Loads.** This section addresses external-load helicopter accessories for transporting equipment and supplies. These components include swivels, leadlines, buckets, hooks, nets, etc., that are attached to the cargo hook of the helicopter.

A. **Approval of Helicopters and Pilots for External Loads.** Each aircraft that is approved for use carries an Aircraft Data Card. Similarly, each Pilot carries a Pilot Qualifications Card (see Chapter 5). Both must be displayed on demand. The card may be issued by the USDA-FS, USDI-OAS, or other authorized government agency, including state and local agencies. Users should always check each Aircraft Data Card and Pilot Qualifications Card to ensure that the aircraft and Pilot are current and authorized to perform the external load mission.

B. **Cargo Baskets and Racks.** Loads contained in cargo baskets are considered external, non-jettisonable loads. All cargo carried in baskets or racks shall be restrained by means of "bungee cords" or other fastening device. Chapter 11 outlines correct methods of loading and carrying cargo in external racks.

CAUTION: Bungee cords or other cargo restraint devices must be fastened securely to the rack. Check for tears, rips, or cracks. Do not use if restraints are damaged.

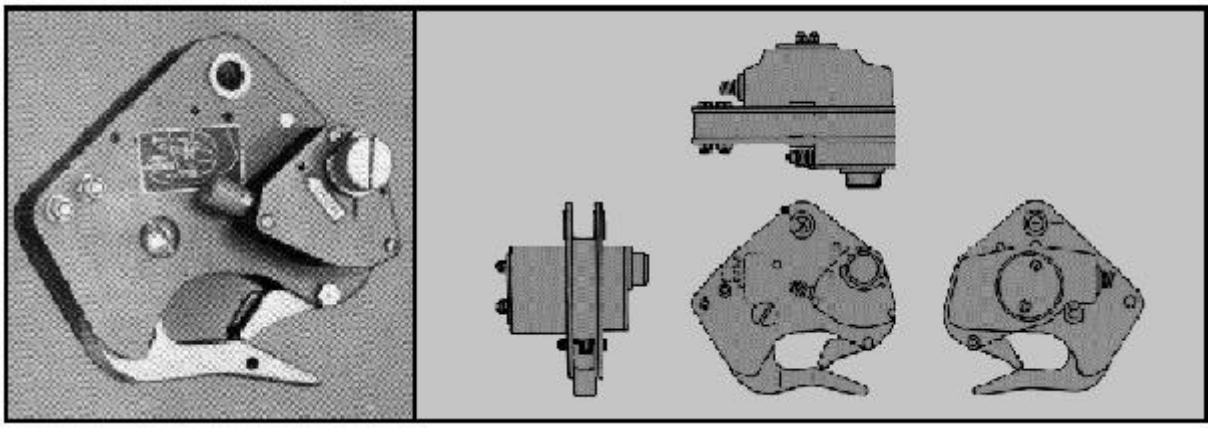
☞C. **Cargo Hook.** (See Exhibit 9-2.) The cargo hook is attached to the belly of the helicopter. It must be FAA-approved, self-cocking and automatic locking. Or may be loaded and locked in a single motion with one hand. The release must be both manually and electrically operated by the Pilot from the cockpit.

The cargo hook also has a manual release on the hook itself that can be operated by the individual performing the hook-up. This release allows the Pilot or hookup person to check that the unit is functioning properly.

CAUTION: Prior to using the hook, it is extremely important first to test the manual release, then the electrical release to ensure that both function properly. This sequence is necessary because the manual release is usually a cable release susceptible to snagging.

Move the cargo hook to its extreme travel limits to ensure that the manual release will not operate inadvertently. There should be at least ½" slack in the operating cable with the hook in all possible positions.

EXHIBIT 9-2: TYPICAL CARGO HOOK

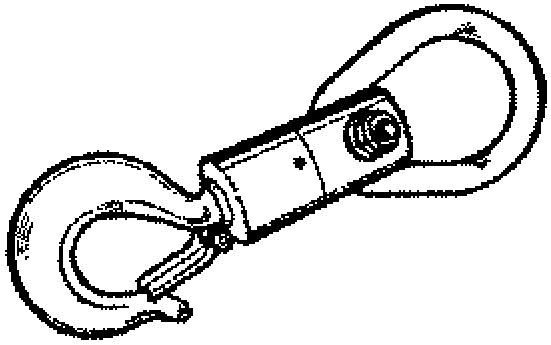


D. **Swivel.** (See Exhibit 9-3.) A cargo swivel consists of a ring or link on the upper end, a hook on the lower end, and a swivel section in between. The ring or link and hook may be integral with or detachable from the swivel body. If detachable, components should be replaceable and attached by bolts secured with self-locking nuts, or some other system that provides equivalent safety.

The hook may have either a simple keeper-gate or an integrated latch system. Both are acceptable for use.

A swivel allows the load to rotate while in flight and prevents the leadline from twisting, preventing cable damage or inadvertent release. Chapter 11 discusses correct methods for placement of the swivel in the load configuration.

EXHIBIT 9-3: TYPICAL SWIVEL



1. **Capacity of Swivels.** Swivels are rated at 3000-pound and 6000-pounds. The rating must be stamped on the swivel. It must have a working capacity equal to or greater than the load to be carried, with an ultimate strength of at least three times the load to be carried.

CAUTION: Swivels without a capacity stamp must not be used.

2. **Inspection and Maintenance of Swivels.** When inspecting swivels, check:

   - The spinning action of the swivel;
   - For swivels with the keeper-gate system, the condition of the keeper-gate on the hook part of the swivel. The keeper-gate is the part of the swivel that generally becomes broken or damaged. Exert force laterally on the keeper gate. If there is significant "play" in the gate, do not use. Also, if the gate can be moved beyond the curved edge of the hook (that is, outside the hook itself), do not use. Be sure to tag the swivel with an explanation of what is wrong with it.
   - For swivels with positive locking, the condition of the integrated latch system.
   - The bolts on the detachable type of swivel.

E. **Leadline.** (See Exhibit 9-4.) A leadline is an accessory that connects the load to the helicopter. A leadline consists of a cable constructed of flexible steel cable, with a ring or link on one end, and a hook on the other. All end loops for leadlines are formed around extra heavy metal thimbles and spliced or swaged.

EXHIBIT 9-4: TYPICAL LEADLINE

Chapter 11 contains a discussion of when and how to use a leadline, when to use longer leadline lengths. etc.

CAUTION: The use of a synthetic leadline made of nylon or polypropylene rope or nylon or natural fiber straps is not normally approved due to the greater potential of these materials to become frayed and fail, or for snapback or streamback into the tail rotor system. However, there are missions such as the aerial transport of live animals where the use of non-twisting synthetic or natural fiber ropes or straps is preferred, and is in fact critical to the well-being of the animals. If utilized, the equipment must be closely inspected.

1. Capacity and Size of Leadlines. Leadlines for most lengths are rated at 3000-and 6000-pounds. Standard length is twelve (12) feet, with twenty-five- (25) and fifty-foot (50') lengths available. The leadline must have a working capacity (test rating) equal to or greater than the load to be carried, with an ultimate strength of at least three times the load to be carried.

2. Inspection and Maintenance of Leadlines. When inspecting leadlines, check:

   - The keeper-gate on the hook at the end of the cable. See the cautionary note concerning keeper-gates on swivels, and follow the same procedures for checking keeper gates on the hook end of leadlines as for swivels.

   - The swages (metal sleeve where the end of the cable forms a loop) to ensure they are secured on the cable. Swages shall be stainless or carbon steel or copper. Swages are painted for slippage check, and should not be covered. Copper swages should have a compression groove from being pressed together. If in doubt, or the cable is kinked, tag the line as out-of-service and do not use.

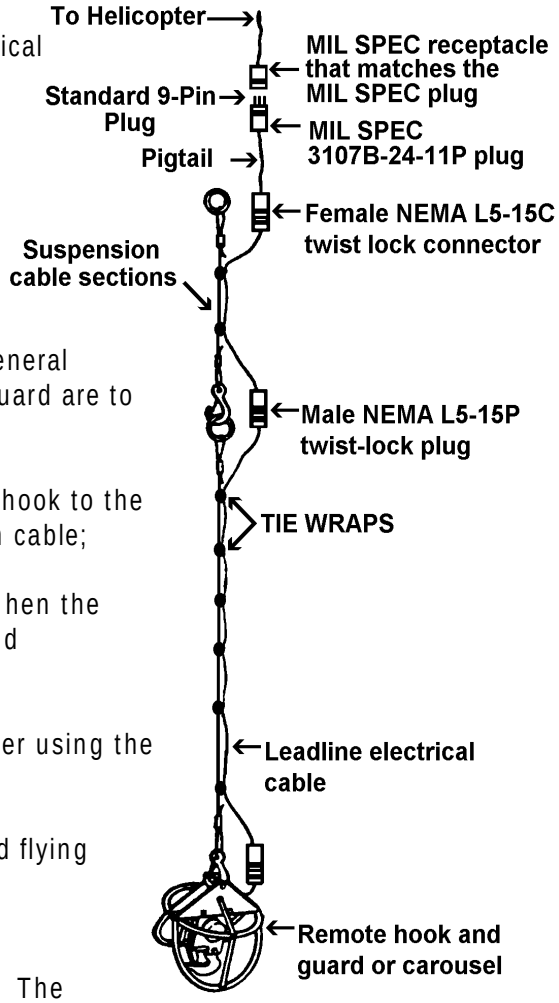
CAUTION: Lead lines with aluminum swages shall not be used.

F. Longline with Remote Electric Hook[1]. (See Exhibit 9-5.) The longline/remote hook system consists of suspension cable sections, a remote cargo hook, a remote hook guard and handgrip, appropriate matching attaching hardware, and electrical pigtail. The Pilot is able to electrically release loads attached to the remote hook.

[1] Remote hook systems are described in detail in "Remote Hook Systems For Helicopters," No. 8457 1203, USDA Forest Service, San Dimas Technology And Development Center, San Dimas, CA 91773.

1. **Remote Hook.** At the end of the cable is a remote electric hook, similar to the cargo hook on the helicopter. An electrical line runs the length of the cable and is plugged into the electrical system of the helicopter. The other end is plugged to the remote hook. The hook is self-cocking (that is, it should return to "latched" position after the electrical "release" signal is removed).

Exhibit 9-5: Typical Longline/Remote Electric Hook Equipment Configuration



2. **Remote Hook Guard.** The general requirements of the remote hook guard are to provide:

   # A medium to attach the remote hook to the remote hook system suspension cable;

   # Protection to the remote hook when the hook is placed on the ground and inadvertently dragged;

   # A hand-hold for the crew member using the remote hook from the ground;

   # Adequate weight to ensure good flying qualities of the remote hook and longline.

3. **Suspension Cable Section.** The system is designed in cable lengths of fifty (50) feet and greater. The line should be constructed of anti-twist, counter-wound cable. The cable attaches to the helicopter cargo hook on one end by means of a steel ring. On the other end, it attaches to the remote hook by means of a hook.

☞ **IMPORTANT NOTE:** Synthetic longline may be utilized by the vendor as suspension cable sections when specified in the procurement document and approved by the agency aircraft inspector.

4. **Inspection and Maintenance of Longline with Remote Electric Hook.** When inspecting longlines with remote hooks and preparing them for use, lay the cables out and check:

- For kinks or abrasions in the electrical cable
- Cracked or broken electrical plugs at each section
- Broken or bent keepers on the hook connections
- Condition of swages at the end of each cable section
- Keepers on hook gates at the end of each line
- That the electrical line is attached to the cable with plastic tie-wraps or duct/electrical tape placed at 12-inch intervals the length of the long line
- That the electric plug to the helicopter is the standard 9-pin plug, and not a twist-type plug (it must be able to release if the long line is jettisoned during an emergency)

CAUTION: Do not place a swivel between the helicopter and the remote hook.

After everything has been checked, attached and plugged in, test to ensure that:

- The electric and manual releases are operational on the helicopter cargo hook;
- The remote hook is functioning.

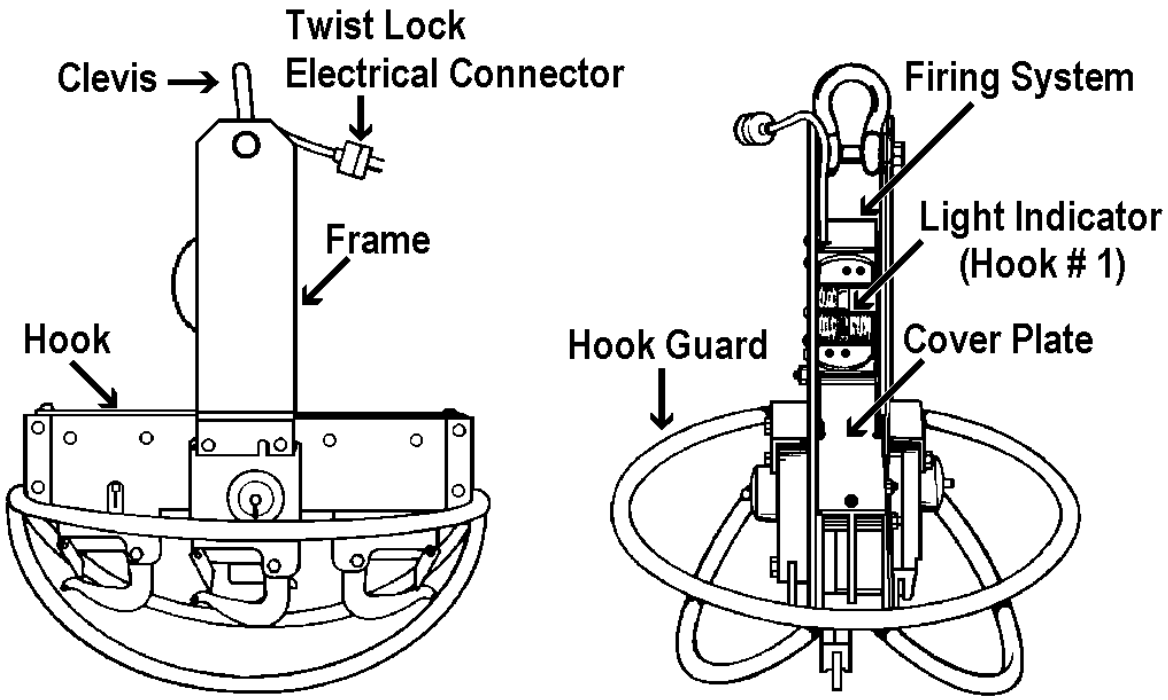
CAUTION: Pay particular attention to the helicopter's emergency manual release cable. Misrouting or improper adjustment of this cable has caused numerous inadvertent releases.

G. **Multiple Remote Cargo Hook System (Carousel Hook).**[1] (See Exhibit 9-6.) This system is identical to the remote hook system, except that an integrated multiple cargo hook device, a carousel, is substituted for the remote hook and remote hook guard. The multiple remote carousel enhances efficiency by allowing the delivery of varying loads to different locations.

A carousel consists of four or more individual hooks mounted together on a single hookguard. The pilot controls the release system from the cockpit.

Check all components associated with the longline system, plus ensure that all electrical connections in the carousel are protected from dust and impact.

Exhibit 9-6: Typical Four-Hook Carousel System



[1] For additional information, see Equip Tips "Four Hook Carousel and Light Cargo Net System," USDA Forest Service, San Dimas Technology And Development Center, San Dimas, CA 91773.

H. Cargo Net.

1. **Heavy Cargo Net.** (See Exhibits 9-8 and 9-9.) Cargo nets come in both round and square configurations. The net is used to transport cargo suspended beneath the helicopter from the cargo hook, permitting delivery without landing. Nets are usually constructed from braided polypropylene or nylon rope.

   Each net consists of a net mesh and a perimeter rope or ropes with tethering rings connecting the segments of the perimeter rope. The lines are attached to the net by loops with plastic thimbles that reinforce the rope loops.

   When tension is applied to the lines, during both load preparation and during lifting, the net is forced closed, similar to a draw-string. This is referred to as a "purse net."

   One or two steel rings are attached to the end of the lines. This is the attachment point to a swivel, leadline, remote hook/longline, or carousel.

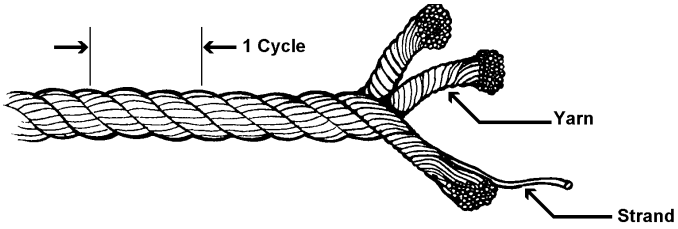
   a. **Capacity and Size of Cargo Nets.** Nets come in the following commonly-available sizes at 3000- and 6000-pound test:

      # Square Nets: 12' x 12' (3000#) or 15' x 15' (6000#)

      # Round Nets: 12' (3000#) or 15' (6000#) Diameter

   b. **Inspection and Maintenance Of Cargo Nets.** See Exhibit 9-7.

Exhibit 9-7: Rope Inspection



When inspecting cargo nets, check:

For broken or worn braids or strands, particularly in the center of the net.

Rope embrittlement, which is caused by exposure to the sun's ultraviolet rays and is the most common cause of net failure. To test for brittleness, bend several areas of the cargo net's rope 180 degrees back upon themselves. If there are brittle strands, they will audibly and visibly break. If more than one or two strands break per bend, do not use the net. Discard it, or return it to the manufacturer for repair.

- All rope loop thimbles for cracks, fractures and missing sections. Thimbles can sometimes be replaced by the net's manufacturer. On some of the heavier cargo nets, the mesh intersections are fixed with molded plastic crosses. These should be visually inspected for cracks and missing parts whenever the loop thimbles are inspected.

- Polypropylene nets for chalking. Run a hand over several of the ropes in the net, grasping the ropes lightly. If small, white, chalk-like fragments of the rope come off in your hand, then chalking has occurred. If chalking is present, it is likely that the net has received enough ultraviolet rays to cause embrittlement, and the net must be further inspected for broken strands as previously discussed before it is returned to service.

- Ultra-violet exposure is the most important factor in the degradation of the strength of cargo nets constructed from polypropylene rope (not use or age). There is no visual or other field inspection technique that will guarantee that a cargo net is free from degradation due to ultra-violet exposure.

  However, if the net is free of brittleness, has no more than 10 percent broken strands in any two adjacent cycles, and there is no chalking or other visible damage, then net is probably safe for further use. If in doubt, remove from service.

NOTE: To prolong the life of cargo nets, utilize duffel bags to avoid unnecessary exposure to sunlight.

Exhibit 9-8: Typical Cargo Net Construction - Round Net

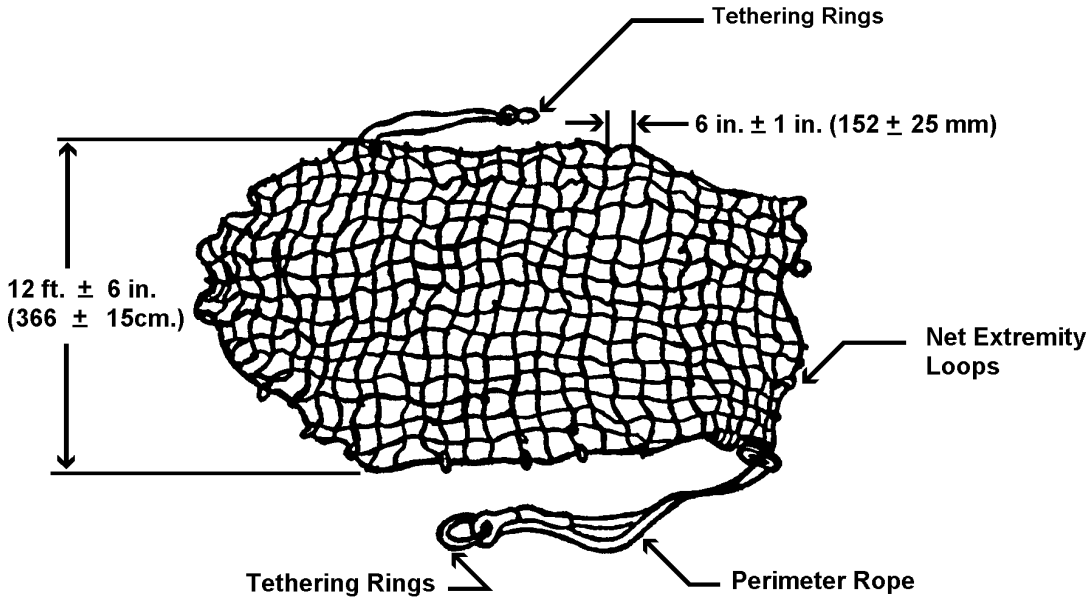
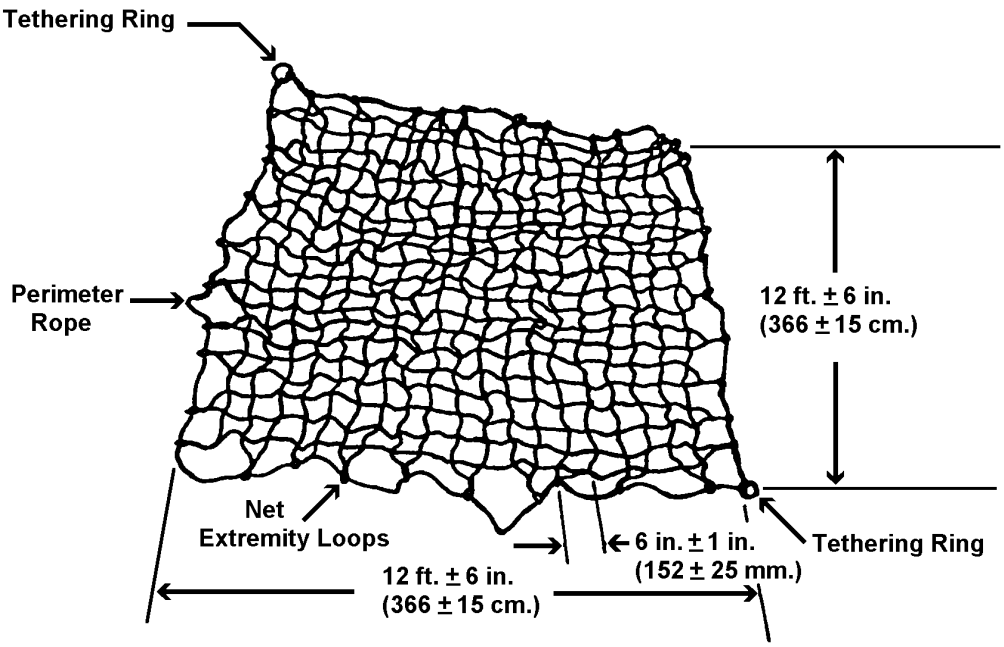


Exhibit 9-9: Typical Cargo Net Construction - Square Net



2. Lightweight Cargo Net. (See Exhibits 9-10, 9-11 and 9-12.) An inexpensive lightweight cargo net constructed of synthetic cord may be desirable for certain operations. Lightweight nets come in round or square configurations, and have a minimum 10-foot and a maximum 12-foot diameter or side dimension. The net weighs approximately 1½ pounds.

The net may have a four-corner pickup instead of a drawstring-style enclosure. Rope intersections are knotted to prevent slippage. Each corner has a 4½-inch opening and is knotted and bonded with fiberglass to the mesh line. There are also three knotted and fiberglassed attachments in each side to ensure rapid and complete deployment.

EXHIBIT 9-10: CORNER LOOP FOR PICKUP OF THE LIGHTWEIGHT CARGO NET

It is recommended that a metal-locking carabinier or pear ring be placed between the corner loops and the swivel.

CAUTION: Lightweight cargo nets have a capacity of only 300 pounds.

Exhibit 9-11: Typical Lightweight Cargo Net

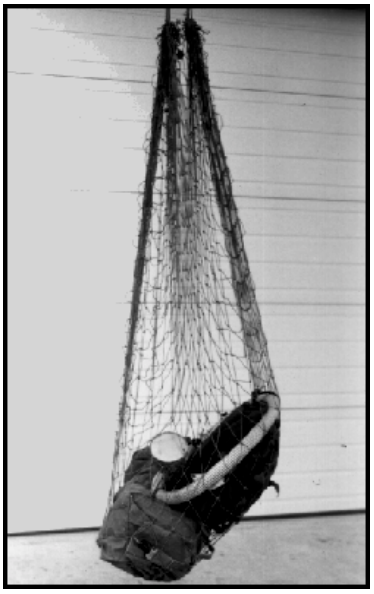
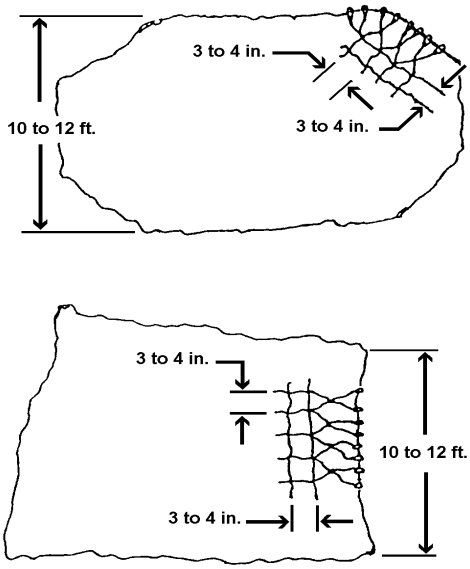


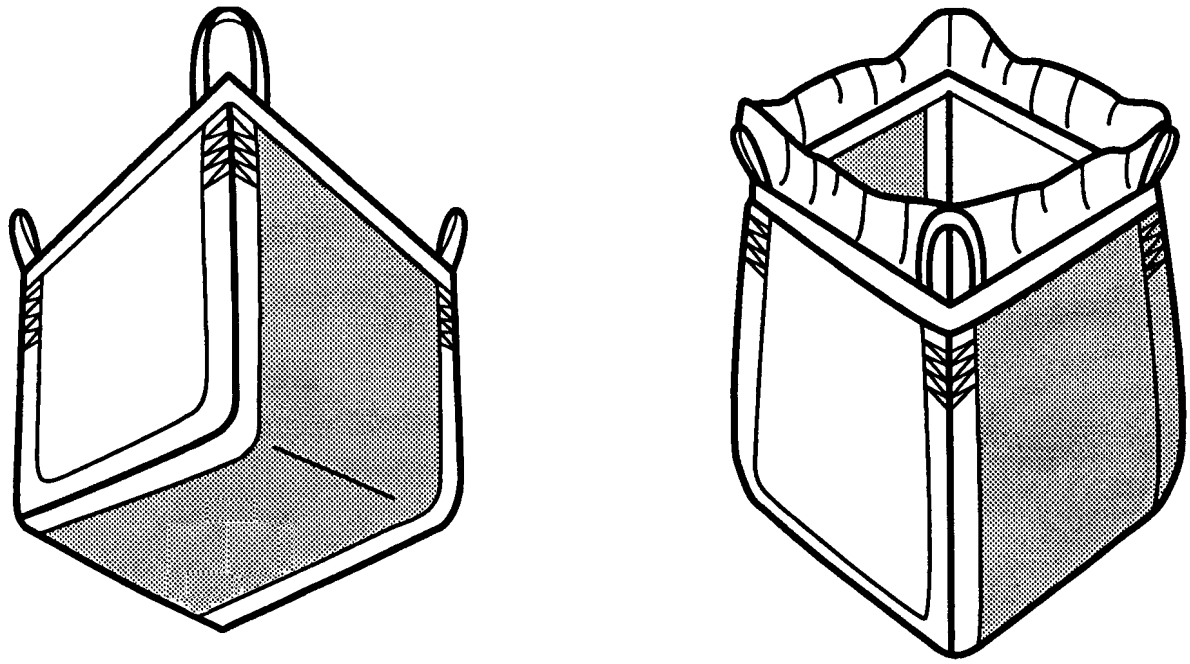
Exhibit 9-12: Typical Dimensions Of Lightweight Cargo Nets - Round and Square



I. **Cargo Lift Bag.** (See Exhibit 9-13.) Cargo lift bags, also known as "flexible intermediate bulk containers," are an inexpensive alternative to cargo nets. They are available in both standard and custom-made sizes, are cubic in shape, and are made from an ultraviolet-resistant polypropylene fabric that "breathes." Most styles have a safety band around the perimeter of the bag. Options include different liners, lifting straps, and filling and emptying capability through a bottom chute. A common size is 35" x 35" x 40", with a weight of 5 pounds.

CAUTION: These bags should not be flown empty due to the potential for tail rotor entanglement. If no cargo is available, 50 pounds of ballast should be placed in the bag. It should be flown at a reduced airspeed. These bags are “Single Trip only” i.e. Use only once.

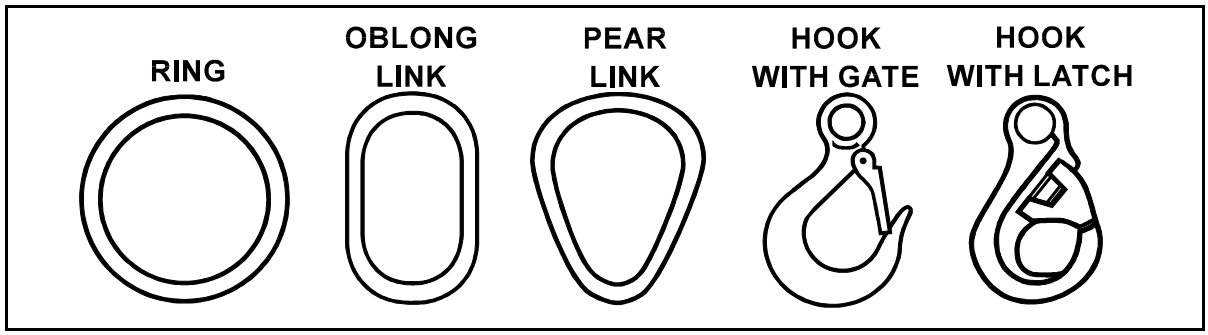
Exhibit 9-13: Typical Cargo Lift Bag



J. **Rings, Links and Hooks.** See Exhibit 9-14 which depicts connector components: rings, links, and hooks. These form the connections between leadlines, cargo hooks, longlines, and/or remote hooks. The size, both inside and outside dimension, of rings, links, and hooks is critical, particularly at the cargo hook connection point, due to the potential for inadvertent release or "hung loads." Sizes must conform to the cargo hook manufacturer's recommendations. See Chapter 11 for a complete discussion of the importance of the cargo hook/ring interface.

CAUTION: Hooks with a keeper-gate and hooks with an integrated latch system are both acceptable for use. Pay particular attention to keeper-gate hook systems. The keeper-gate is the part of the hook that generally becomes broken or damaged. Exert force laterally on the keeper gate. If there is significant "play" in the gate, do not use. Also, if the gate can be moved beyond the curved edge of the hook (that is, outside the hook itself), do not use. Be sure to tag the hook with an explanation of what is wrong with it.

Exhibit 9-14: Rings, Links And Hooks



K. **Buckets.** (See Exhibits 9-15, 9-16, and 9-17.) Buckets are typically used on fires to dispense liquids such as water, fire retardant, and foam. Specialized buckets for transporting concrete, sand, gravel, and other building materials are available for use on projects.

The Pilot remotely activates the bucket mechanism. Each bucket consists of an open top shell, a bottom discharge door, control mechanism, support cable, and fittings. There are two basic shell designs, collapsible and rigid. A version of the collapsible type is also foldable. A Pilot-operated electrical switch mounted on the collective control must be the only switch to activate the discharge door.

Most buckets used for hauling water also have a foam-injection system for adding foam concentrate to the water while in flight.

Several methods are used to limit bucket capacity so that the weight of the water that fills the bucket is within the allowable payload limit. These include zippers, port caps, and cinch straps. If port caps or plugs are used as part of the capacity limiting system, they should be fastened to the bucket to prevent loss or damage.

The weight of the bucket and capacity at each position or adjustment level must be marked on the bucket.

☞ **IMPORTANT NOTE:** Refer to Chapter 7, III, 14, for more information on managing bucket payloads.

Exhibit 9-15: Typical Bucket - Rigid Shell

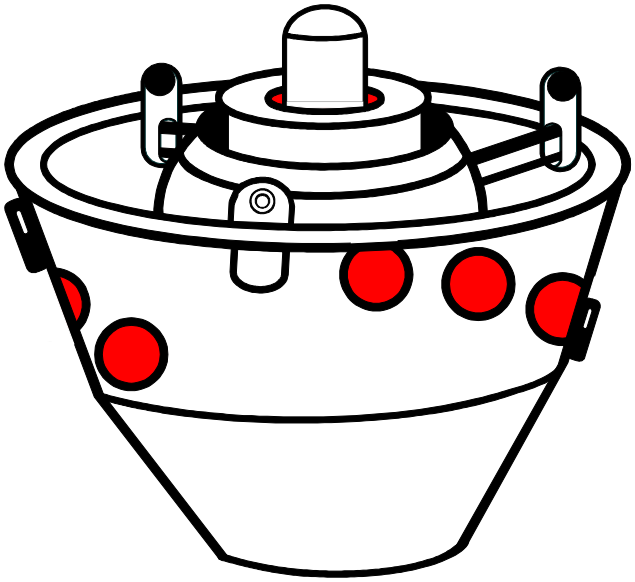


Exhibit 9-17: Typical Bucket - Collapsible/Foldable

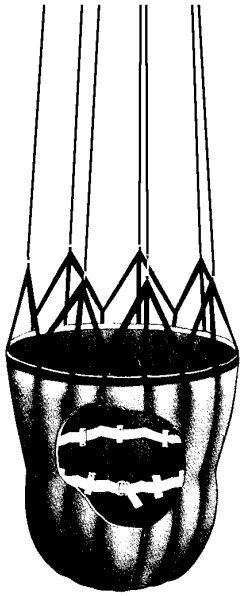
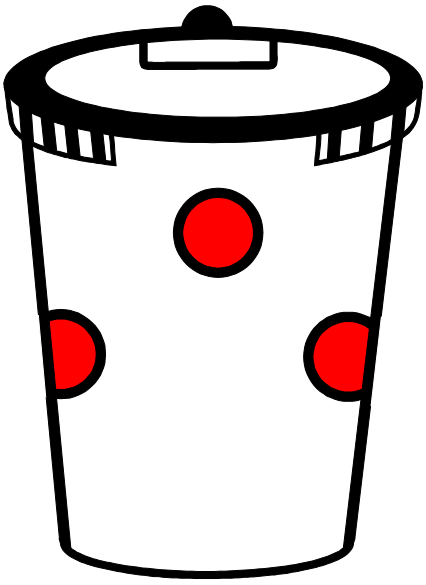


Exhibit 9-16: Typical Bucket - Collapsible



L. **Helicopter Fixed Tank.** (See Exhibits 9-18 and 9-19.) A helicopter fixed tank is used to transport water, foam, or retardant to the fireline. The tank is attached to the belly of the helicopter (some tanks require removal of the cargo hook).

Tanks are usually filled with water from hoses connected to engines, fixed ground tanks, or other sources. When retardant is utilized, a portable retardant mixing site is located adjacent to the fill site. Tanks may also have on-board foam-injection systems.

Some helicopter fixed tanks have the capability to draw water via an extended nozzle or snorkel while hovering above the water source (see Exhibit 9-19).

CAUTION: Do not use Lignin Sulphate dust abatement product in fixed tanks.

EXHIBIT 9-18: HELICOPTER FIXED TANK

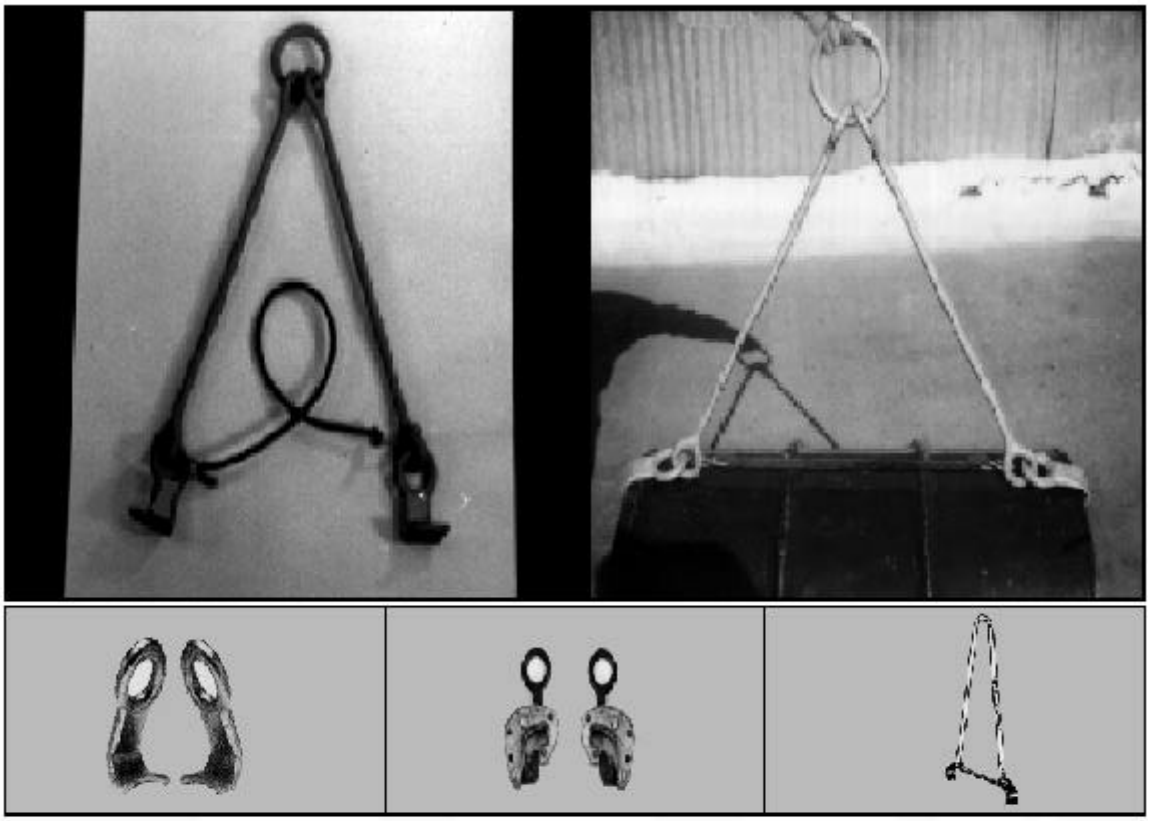
EXHIBIT 9-19: HELICOPTER FIXED TANK WITH SNORKEL

VIII. **Specialized External Load Equipment.** External load equipment has been designed to transport items whose dimensions or other characteristics preclude use of conventional cargo nets and/or leadlines. These include:

A. **Barrel Hooks/Clamps.** (See Exhibit 9-20.) Barrel hooks are made of chain or cable. Two sets are usually used together. A bungee cord with a clip on one end allows the pilot to independently hook up loads. Not attaching the bungee allows the hooks to drop off the barrels on touchdown at an unattended site.

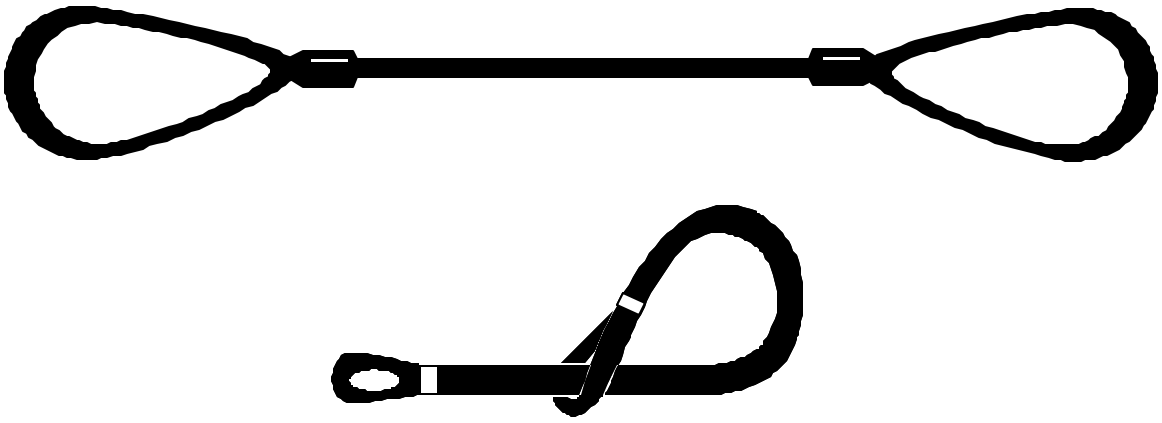
NOTE: A cargo net is the recommended method for transporting barrels.

EXHIBIT 9-20: BARREL HOOKS/CLAMPS



B. **Chokers.** (See Exhibit 9-21.) Chokers are utilized primarily to transport logs, lengths of pipe, or other materials that are too long or bulky to be transported in a cargo net. They are made of wire rope, nylon, chain, etc. Logging operations use a cable choker with a ball on the end that clips into a sliding catch further up the cable. The result is that the cable "chokes" down on the load when it is under tension. See Chapter 11 for more information on the correct rigging of chokers.

EXHIBIT 9-21: TYPICAL CHOKERS

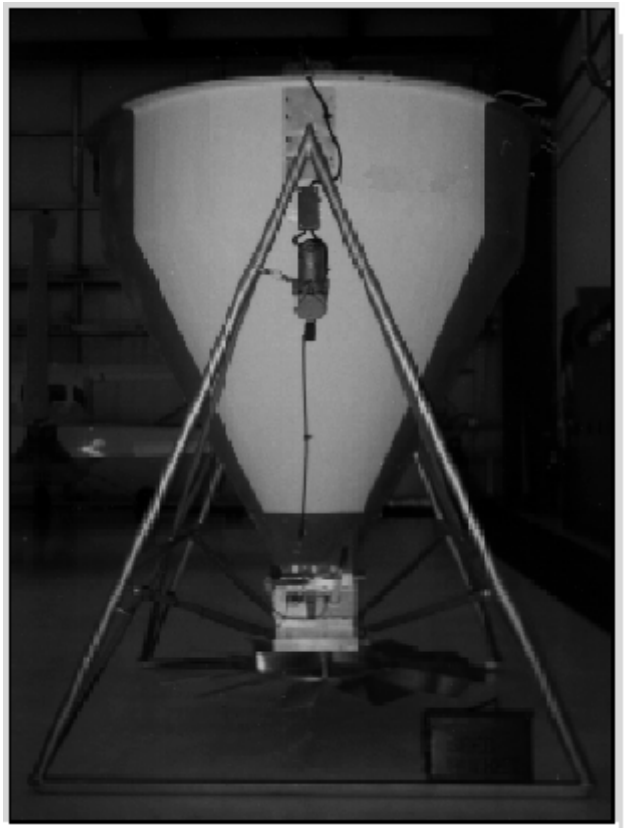


CAUTION: Since chokers are less secure than other external load equipment (eg, nets), be especially careful not to fly over persons or structures.

CAUTION: Chokers are not to be utilized as a leadline.

C. **Seed and Fertilizer Spreaders.** (See Exhibit 9-22.) Spreaders are typically self-contained in that only power and control is required from the helicopter to operate the device. They are supplied complete with appropriate rigging and lines for connection to the helicopter cargo hook. In some cases, spreaders are supplied with their own internal combustion engine. See manufacturer's literature for specific operating instructions and weights for load calculations.

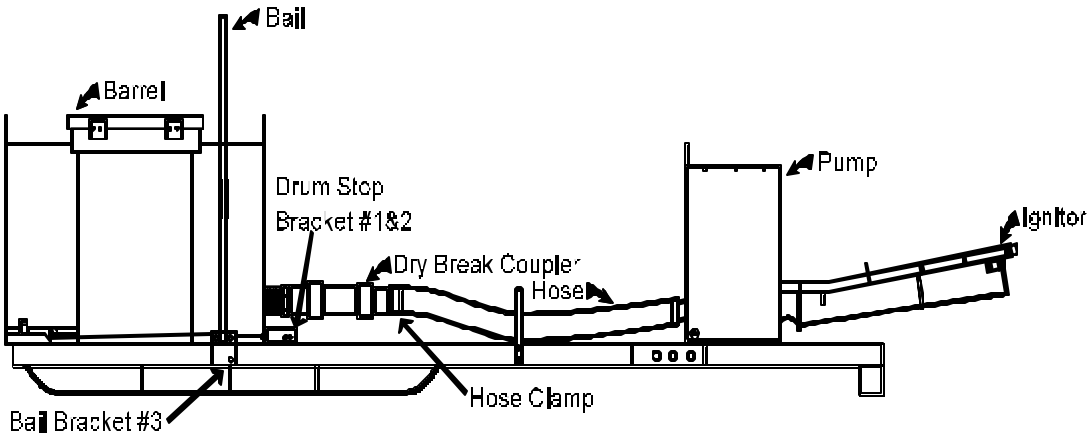
EXHIBIT 9-22: TYPICAL SEEDER CONFIGURATION



D. Helitorch. (See Exhibit 9-23.) The helitorch is a completely self-contained unit used for the aerial ignition of slash, backfires on forest and range fires, and field burning. The torch applies gelled gasoline or diesel fuel and provides a hotter, faster, and longer ignition than other methods, such as the handheld drip torch or plastic sphere dispenser. The unit is completely jettisonable from the cargo hook in an emergency. It is hung from the aircraft at an attitude to give the pilot maximum visibility and control. The unit will fit on any helicopter which has a cargo hook and a 28-volt system for power supply. A complete helitorch system includes control cables, aluminum mixing paddle, extra barrel, spreader bar and augmented ignition system.

For further information, refer to the Interagency Aerial Ignition Guide. See manufacturer's literature for specific operating instructions and weights for load calculations.

EXHIBIT 9-23: TYPICAL HELITORCH



E. Plastic Sphere Dispenser (PSD). (See Exhibit 9-24.) The PSD is a very effective aerial ignition tool when used to ignite light, flashy fuels. The device functions by injecting glycol into a plastic sphere ("ping-pong ball") which contains potassium permanganate. An exothermic reaction starts, and the dispenser expels the primed sphere from the aircraft. It is designed to accomplish this process with minimum manipulation and a high degree of safety and reliability.

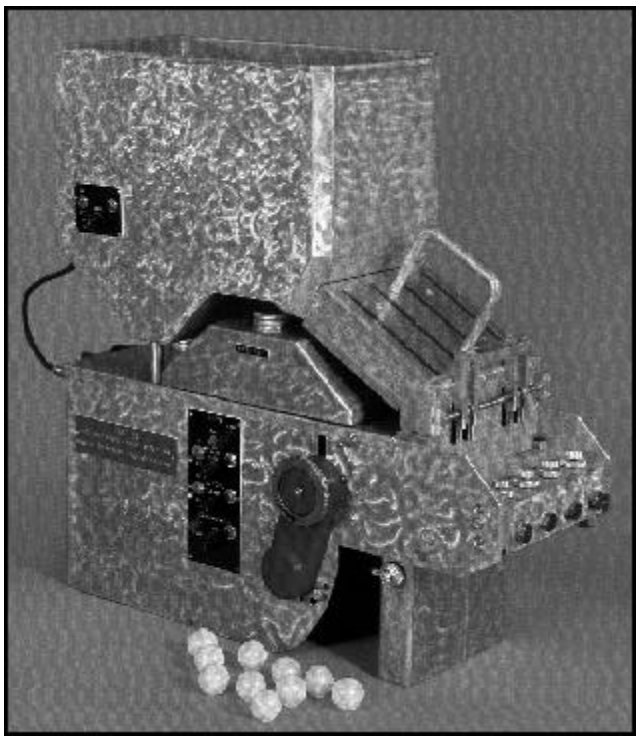
The main frame of the dispenser is constructed of welded aluminum. Power is supplied to the dispenser from the aircraft power supply through a quick-disconnect fitting and internal fusing. A central control panel contains all

the electrical components and switches to operate the different stations such as the main drive, glycol pump, slow-fast speed and the emergency water supply. All electrical controls

for this operation are conveniently located on the hopper.

For further information, refer to the Interagency Aerial Ignition Guide. See manufacturer's literature for specific operating instructions and weights for load calculations.

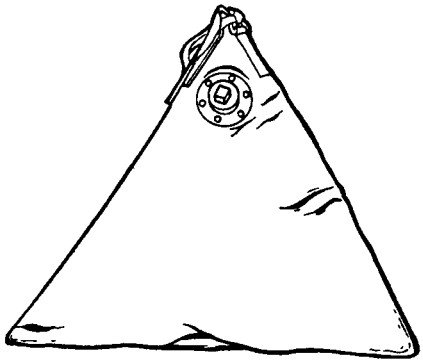
EXHIBIT 9-24: TYPICAL PLASTIC SPHERE DISPENSER

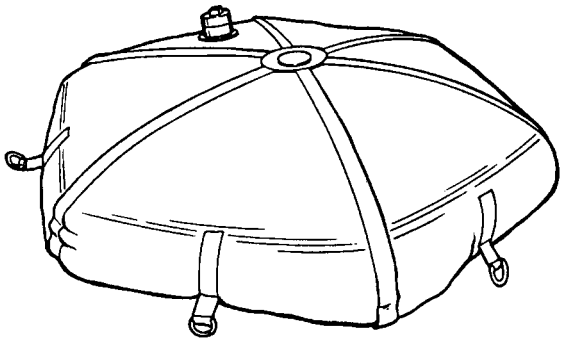


F. Slingable Bags (Potable and Non-Potable Water, Fuel). (See Exhibit 9-25.) Slingable bags are flexible and somewhat self-supporting. They are used to transport and store various liquids (potable water, water for firefighting, fuel, etc.). The bags are designed and constructed to be attached to a leadline, which in turn attaches to the swivel and cargo hook on the helicopter. See Appendix K for different sizes available.

CAUTION: Avoid placement on slopes unless there are personnel on the ground to secure the bag. Otherwise, it may roll downhill. When transporting empty water bags they must be taped into a compact package, and attached to the leadline or longline with a swivel.

Exhibit 9-25: Typical Slingable Water Bags: Top: Less Than 160 Gallons Bottom: 300 Gallons





IX. **Ground-Based Tank Systems for Helicopter Dipping and Filling.** See Appendix K for different sizes available.

A. **Portable Auxiliary (Rigid) Water Tanks.** (See Exhibit 9-26.) Portable auxiliary (rigid) water tanks are designed for standby water storage during fire suppression or other operations requiring a reserve water supply. Water may be mixed with retardant in the tank using a portable retardant blender. Tanks are available in 600- to 3000-gallon configurations.

CAUTION: Tanks must be tethered to the ground with ropes or cord, with rocks or other material placed in the bottom of the tank to prevent the tank from being blown into the helicopter rotor system.

Rigid tanks may be used in the following manner:

- Helicopters may dip out of the tanks, which are filled from either a natural water source such as a stream or pond or from a mobile source such as a water tender.

- Helicopters may transport water to the tank via bucket or fixed-tank system, with water supply operations to the line conducted by pumping or gravity feed out of the tank. Use of this method can significantly increase water efficiency, especially during mopup, particularly if tanks are strategically placed.

EXHIBIT 9-26: TYPICAL PORTABLE AUXILIARY (RIGID) WATER TANKS

B. **Self-Supporting Open-Top ("Pumpkin") Water Tanks.** See Exhibit 9-27. Self-supporting ("pumpkin") open-top water tanks come in many sizes and hold water or retardant. They may either be filled by ground from a water or retardant source for helicopters to dip out of, or they may be supplied by helicopter bucket to support hose lay operations off the tank.

Tanks are designed and constructed to be transportable in a compact, collapsed state. A buoyant collar surrounds the top opening. Hydrostatic pressure supplies the only support.

CAUTION: The top opening, even in the largest tanks, may be too small for Type 1 helicopter buckets to be safely filled from the tank.

EXHIBIT 9-27: TYPICAL SELF-SUPPORTING OPEN-TOP ("PUMPKIN") TANK

X. Helicopter Manager's Kit. The kit items indicated on Chart 9-10 below are recommended for a Helicopter Manager's Kit for both incident and project use. Helicopter managers are responsible for assembling the kit and maintaining it. Additional copies of forms should be reproduced locally at the incident.

CHART 9-10: RECOMMENDED HELICOPTER MANAGER KIT ITEMS

QUANTITY	ITEM
1 Ea	Personal portable programmable radio for air-to-ground communications
1 Ea	Adapter for AM Portable Radio
1 Ea	Flight Helmet with Bag
1 Ea	Nomex Flight Suit and Nomex Gloves
1 Ea	Goggles, Earplugs, Work Gloves
1 Ea	Aluminum Clipboard with Storage
1 Ea	Belt Weather Kit
1 Bk	Interagency Helicopter Operations Guide (IHOG)
1 Bk	Transportation of Hazardous Materials Handbook
1 Bk	Aviation Technical Assistance Telephone Directory
	IHOG Forms Package (HCM Forms), to include:
20 Ea	HCM-1, Aircraft Contract Daily Diary
5 Ea	HCM-2, Helicopter and Service Truck Pre-Use Checklist
2 Ea	HCM-3, Aircraft Fuel Facility Inspection Log
1 Bk	HCM-4, Helicopter Power Check Turbine Engine
1 Ea	HCM-5, Helicopter Turbine Engine Performance Analysis Chart
10 Ea	HCM-6, Helicopter Information Sheet
10 Ea	HCM-7, Helicopter Crew Information Sheet
3 Bk	HCM-8, Helicopter Load Calculation
5 Bk	HCM-9, Helicopter Passenger/Cargo Manifest
10 Ea	HCM-10, Handcrew Passenger/Cargo Helicopter Manifest
10 Ea	HCM-11, Single Helicopter Load Capability Planning Summary - Multiple Helispots and Fuel Loads
20 Ea	HCM-12, Flight Order: Helicopter
5 Ea	HCM-13, Helicopter Crew Action Report
2 Ea	HCM-14, Pilot Flight Time/Duty Day Cumulative Log
2 Ea	HCM-15, Driver Driving Time/Duty Day Cumulative Log
2 Ea	HCM-16, Mechanic Duty Day Cumulative Log
20 Ea	HCM-16, Helicopter Daily Use and Cost Summary
NA	IHOG Appendices (Checklist and Reminders Lists)
1 Ea	Appendix F, Daily Helicopter Operations Briefing/Debriefing Checklist
5 Ea	Appendix G, Daily Helicopter Operations Briefing/Debriefing Checklist - Helibase Crew Reference
1 Ea	Appendix H, Helibase Manager's Reminders List
1 Ea	Appendix I, Remote Fuel Site Reminders List
1 Ea	Appendix K, Aviation Publication And Helicopter Operations Ordering List
10 Ea	Safecom OAS-34 (FS 5700-14) Jan 96
5 Ea	Passenger Aircraft Safety Briefing Cards

CHART 9-10: RECOMMENDED HELICOPTER MANAGER KIT ITEMS (CONT.)

QUANTITY	ITEM
1 Bk	OF-261 Crew Time Report
10 Ea	OF-288 Firefighter Time Report
5 Ea	CA-1 Personal Injury Forms
1 Ea	Fireline Handbook 410-1
1 Ea	Copy of the current National CWN Helicopter Contract
1 Ea	Copy of Appropriate Rental Agreement (if applicable)
1 Ea	USDA/USDI Aircraft Radio Communications and Frequency Guide
1 Ea	Aircraft Sectional Maps and Local Map Set
1 Ea	Agency Contract Administration Guide/Handbook
1 Bk	OAS 23 Aircraft Use Report
1 Bk	FS 6500-122 Flight Use Report
2 Ea	FS Cumulative Aircraft Use Summary
10 Ea	Notices of Non-Compliance
1 Ea	Flagging, filament tape, signal vest, signal mirror
As appropriate	Calculator; Clock; IDEA (Yellow) Pads; Writing Paper; Pens and Pencils; Grease Pencils; Felt-tipped Markers; Expando Files; Stapler; Flashlight
1 Ea	Cargo Net (if vehicle available)
1 Ea	Leadline (12 feet) (if vehicle available)
2 Ea	Swivel (if vehicle available)
1 Ea	Helicopter Support Kit (if vehicle available)

XI. **Helibase Manager's Kit.** The kit items indicated on Chart 9-11 are recommended for a Helibase Manager's Kit for both incident and project use. Helibase Managers are responsible for putting the kit together and maintaining it. Additional copies of forms should be reproduced locally at the incident.

CHART 9-11: HELIBASE MANAGER KIT ITEMS

QUANTITY	ITEM
1 Ea	Personal programmable portable radio for air-to-ground communications
1 Ea	Adapter for AM Portable Radio
1 Ea	Flight Helmet with Bag
1 Ea	Nomex Flight Suit and Nomex Gloves
1 Ea	Goggles, Earplugs, Work Gloves
1 Ea	Aluminum Clipboard with Storage
1 Ea	Belt Weather Kit
1 Bk	Interagency Helicopter Operations Guide (IHOG)
1 Bk	Transportation of Hazardous Materials Handbook
1 Bk	Aviation Technical Assistance Telephone Directory
1 Ea	Aircraft Sectional Maps and Local Map Set
	IHOG Forms Package (HCM and HBM Forms), to include:
1 Ea	HCM-1, Aircraft Contract Daily Diary
1 Ea	HCM-2, Helicopter and Service Truck Pre-Use Checklist
1 Ea	HCM-3, Aircraft Fuel Facility Inspection Log
1 Ea	HCM-6, Helicopter Information Sheet
1 Ea	HCM-7, Helicopter Crew Information Sheet
1 Bk	HCM-8, Helicopter Load Calculation
1 Bk	HCM-9, Helicopter Passenger/Cargo Manifest
1 Ea	HCM-10, Handcrew Passenger/Cargo Helicopter Manifest
1 Ea	HCM-11, Single Helicopter Load Capability Planning Summary - Multiple Helispots and Fuel Loads
1 Ea	HCM-14, Pilot Flight Time/Duty Day Cumulative Log
1 Ea	HCM-15, Driver Driving Time/Duty Day Cumulative Log
1 Ea	HCM-16, Mechanic Duty Day Cumulative Log
1 Ea	HCM-17, Helicopter Daily Use and Cost Summary
5 Ea	HBM-1, Helibase Organization Chart
5 Ea	HBM-2, Helispot Information Summary
3 Ea	HBM-3, Helibase Aircraft Information Summary
5 Ea	HBM-4, Load Capability Planning Summary (By Multiple Helispots)
5 Ea	HBM-5, Load Capability Planning Summary (By Individual Helispot)
2 Ea	HBM-6, Helicopter Resource Planning Capability Chart
5 Ea	HBM-7, Helibase Flight Time Tracking Record
10 Ea	HBM-8, Helibase Mission Request Log
10 Ea	HBM-9, Helibase Flight Following Log
10 Ea	HBM-10, Helibase Daily Use and Cost Summary
3 Ea	HBM-11, Helibase Emergency Rescue Plan
3 Ea	HBM-12, Emergency Medical Services - Helicopter Ambulance Request
10 Ea	HBM-11, Helicopter Demobilization Information Sheet

CHART 9-11: HELIBASE MANAGER KIT ITEMS (CONT.)

QUANTITY	ITEM
	IHOG Appendices (Checklists and Reminders Lists)
2 Ea	Appendix F, Daily Helicopter Operations Briefing/Debriefing Checklist
1 Ea	Appendix G, Daily Helicopter Operations Briefing/Debriefing Checklist - Helibase Crew Reference
1 Ea	Appendix H, Helibase Manager's Reminders List
1 Ea	Appendix I, Remote Fuel Site Reminders List
1 Ea	Appendix K, Aviation Publication And Helicopter Operations Ordering List
	ICS Forms, to include:
10 Ea	ICS-213 General Message
10 Ea	ICS-214 Unit Log
5 Ea	ICS-224 Crew Performance Rating
10 EA	ICS-206-1 Resource Order, 4 Part
5 Ea	Safecom OAS-34 (FS 5700-14)
5 Ea	Passenger Aircraft Safety Briefing Cards
1 Bk	OF-261 Crew Time Report
1 Ea	OF-288 Firefighter Time Report
5 Ea	CA-1 Personal Injury Forms
1 Bk	Fireline Handbook 410-1
1 Ea	Copy of the current National CWN Helicopter Contract
1 Ea	USDI/USDA Aircraft Radio and Communications Frequency Guide
1 Ea	Agency Contract Administration Guide/Handbook
1 Bk	OAS-23 Aircraft Use Report
1 Bk	FS 6500-122 Flight Use Report
2 Ea	Notices of Non-Compliance
As appropriate	Calculator; Clock; IDEA (Yellow) Pads; Writing Paper; Pens and Pencils; Grease Pencils; Felt-tipped Markers; Expando Files; Stapler; Flashlight

XII. **Recommended Standard Contract Helicopter Crew Support (Chase) Truck.** The following specifications are a recommended standard for a fire exclusive-use contract helicopter crew ground vehicle:

- Vehicle with GVWR capable of carrying helicopter support and associated equipment listed on Chart 9-12.
- 6-Passenger Crew Cab
- High-Profile Utility Body, or Trailer

XIII. **Recommended Standard Equipment for Contract Helicopter Crew Support (Chase) Truck.** The stocking levels indicated in Chart 9-12 enable the exclusive-use contract fire helicopter crew to meet not only local initial attack needs, but also the minimum equipment and operational needs for establishing a helibase during the initial phases of a large incident. This capability is essential since there may be multi-day delays in obtaining required helibase safety and operational equipment through warehouse caches.

These items should be carried on board the chase truck to all incidents or projects.

Helicopter Managers are responsible for obtaining and maintaining the stocking levels. Managers are also responsible for updating the NFES numbers on the attached list if an item's number changes in the NFES catalog.

Local units with moderate to high fire activity, or with recurrent project helibase operations, are encouraged to stock an adequate supply of helibase management equipment (cargo nets, leadlines, swivels, etc.) in the local fire cache.

CHART 9-12: RECOMMENDED STOCKING LEVEL FOR EXCLUSIVE-USE FIRE CONTRACT OR AGENCY-OWNED HELICOPTER CREW VEHICLE

QTY	WT (LBS)	NFES #	ITEM
2 Ea	2		Adapter, SPH-4 to VHF Handheld
1 Ea	1		Atlas, Road, Continental U.S
1 Bx	12	0021	Bag, Garbage Can Liner, Plastic
1 Ea	13	0426	Bag, Slingable, Water, 72-Gal, Non-Potable
2 Ea	9	0030	AA Penlight Batteries, VHF-FM Radio
1 Ea	2	0298	Beacon, Strobe w/ Battery, Flashing
6 Ea	1		Helibase Organization Bulletin Board
2 Ea	2		Bungee Cords
1 Ea	4	0085	Can, Gas, 1 Gal., A/C Approved
2 Ea	40	0265	Can, Gas, 5 Gallons (Full)
3 Ea	1		Can, Dolmar, STC
1 Ea	6	1063	Canteen, 4-Qt, Plastic
30 Ea	33		Chain, Tow, 20'
1 Ea	1	0213	Chin Straps
2 Ea	1	0288	Clock, Alarm
300 Ft	1		Clock, Timer (Flight Following)
2 Ea	3	0533	Cord, Parachute
100 Pr	3		Signs, Directive (No Smoking, Helibase, etc.)
2 Ea	2	1027	Earplugs, Foam
1 Ea	46	0307	Extinguisher, 20 lb., Dry Chemical, 40 B:C
2 Ea	13	2143	Extinguisher, Dry Chemical, 5 Lb.
300 Ft	6	0169	Fire Shelters
10 Ro	4	0534	Flagging, Perimeter
4 Ea	1	2398	Flagging, Ribbon
3 Pl	8		Flight Suits, Nomex, (Spare)
2 Cs	135		Foam, Fire, 5-Gal.
1 Ea	40	1842	Food, Ration-Type, MREs
1 Bx	25		Helicopter Manager's Kit
3 Ea	36	0105	Fusees
1 Bx	2		Gloves, Forest Worker (Spare)
3 Pr	1		Gloves, Nomex, Assorted Sizes 9-11 (Spare)
4 Pr	2	0295	Gloves, Fluorescent
2 Ea	2	1024	Goggles, Sand/Wind/Dust
4 Ea	2	0109	Hard Hat (Spare)
1 Se	8	0110	Headlamp w/ Batteries (Spare)
2 Ea	15	0537	Helipad Markers, Panels, w/ Stakes
1 Ea	10	1315	Helmet, Flight, SPH-4, X-L (Spare)
1 Se	30		Jack, Handyman or Hydraulic
1 Se	10		Jumper Cables
	10		Ice Chest (Large Size)

CHART 9-12: RECOMMENDED EQUIPMENT LIST FOR EXCLUSIVE-USE CONTRACT HELICOPTER CREW VEHICLE (CONT.)

QTY	WT (LBS)	NFES #	ITEM
1 Ea	2	1050	Kit, Belt Weather
1 Ea	47	0340	Kit, Chainsaw
1 Ea	3	1143	Kit, First-Aid, 10-Person Belt Type
1 Ea	26	1040	Kit, Rescue, Crash
4 Ea	24	0528	Leadline 12', 3000# Test
10 Pd	2	1064	Load Calculation Books
1 Ea	105	0849	Long Line, Remote Hook (N/A If Contract Requirement)
10 Pd	2	1289	Manifest Books
20 Ea	1	0131	Mask, Air Filtering
10 Ea	3	0284	Message Droppers
2 Ea	92	0458	Nets, Cargo, 15' x 15', 6000# Test
2 Ea	48	0531	Nets, Cargo, 12' x 12', 3000# Test
2 Ea	6	1855	Packs, FSS
1 Ea	113		Portatank (Collapsible, Free-Standing or Rigid) (1000-Gal. Minimum For Light Helicopter;) (6000-Gal Collapsible, Free-Standing for Medium Helicopter)
1 Ea	1		Programming Plug (King Radios)
1 Ea			Pump, Portable
4 Ea	12	1149	Pumps, Backpack
1 Ea			Radio, Aircraft Base Station, VHF-AM
2 Ea	6		Radios, VHF-AM Personal Portable w/ Batteries
1 Ea	3		Radios, VHF-FM Personal Portable w/ Batteries (Spare)
1 Ea	5		Scales, Platform/Bathroom
2 Ea	10	0532	Scales, Spring, 200#
3 Ea	15	0171	Shovels
2 Ea	2	0297	Signal Wands
1 Ea	8	1858	Sledge Hammer, 8-Lb
1 Ea	40		Stretcher (Size appropriate to helicopter)
6 Ea	24	0526	Swivels, 3000#
20 Ea	1	0216	Tags, Wire
10 Ea	1		Tags, Red, Wire
2 Ro	4	0071	Tape, Duct
2 Ro	1	0619	Tape, Electrical, Plastic
10 Ro	5	0222	Tape, Filament
1 Ea	1	0070	Tent Fly
3 Ro	2	0142	Toilet Paper
1 Can	1		WD-40
1 Sl	1	1312	Wire, Safety
2 Ea	13	0296	Tool, McCloud
3 Ea	15	0146	Tool, Pulaskis
1 Ea	40		Tool Box (pliers, wrenches, etc.)

CHART 9-12: RECOMMENDED EQUIPMENT LIST FOR EXCLUSIVE-USE CONTRACT HELICOPTER CREW VEHICLE (CONT.)

QTY	WT (LBS)	NFES #	ITEM
1 Ea	4		Tool Roll, Portable Fire Pump
3 Ea	2	0292	Vests, Visibility (Orange)
15 Gl	120		Water, Drinking
2 Ea	2	0308	Wind Sock, Small, 9" x 30"
1 Ea	4	2419	Wind Sock, Large, 30 Knot
	1,360		